DOCUMENT RESUME

ED 445 896 SE 063 870

AUTHOR Slay, Jill
TITLE The Nature of Nature: Chinese Culture and Science Education.
PUB DATE 2000-01-00
NOTE 10p.; Paper presented at the Annual Meeting of the National Association for Research in Science Teaching (Boston, MA, March 28-31, 1999).
PUB TYPE Opinion Papers (120)
EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Cultural Differences; Cultural Traits; Culture; Elementary Secondary Education; English; Foreign Countries; *Science Curriculum; *Science Education; *Scientific Principles
IDENTIFIERS China

ABSTRACT

This paper examines the concept of nature from the perspective of Chinese history and culture, and is partially based on personal experiences. The perspective used to understand science education in the culture is one that science itself maintains a culture-independent existence. Students in China worry about the lifestyle of the West, however they have no concept of Western culture and values. Concludes that Western knowledge and influence has an important place in the science curriculum and education in China. (Contains 17 references.) (YDS)

Reproductions supplied by EDRS are the best that can be made
from the original document.

ED 445 896

The Nature of Nature: Chinese Culture and Science Education

by

Jill Slay

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
This document has been reproduced as received from the person or organization originating it.
Minor changes have been made to improve reproduction quality.
Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

SE 063 870

BEST COPY AVAILABLE

The Nature of Nature: Chinese Culture and Science Education

Jill Slay,

Flexible learning Centre, University of SOuth australia / Science and Maths education Centre, Curtin University of Technology, Perth, Western Australia

Paper presented at the annual meeting of the National Association for Research in Science Teaching (NARST), Boston, March 28th-31 st 1999.

Introduction

This paper has a particular focus on the nature and role of "nature" in the science curriculum in Mainland China. It reports on a portion of my recently completed ethnographic fieldwork, part of my doctoral studies entitled "Culture and Conceptualisations of Nature: An Interpretive Analysis of Australian and Chinese Perspectives".

In this paper I examine the concept of "nature" from a Chinese historical and cultural perspective, to provide an *epic description* (Ogawa, 1998, p141) of science and science education in China. Here I identify features of theory and practice which are culturally and historically uniquely Chinese, and situate the Chinese "image" of nature with respect to both Japanese and Western images of the same.

Theoretical Perspective

I adopt the perspective of Ogawa (1998, p139) that science and science education as understood in any culture is an interpretation by the people of that culture. Ogawa emphasises that while the context-dependency of science education is well recognised, it is generally understood that "science" itself maintains a "culture-independent existence". Ogawa argues that science itself is a cultural "image". He deals with this concept of "image" and produces a cultural and historical background linking the Japanese way of thinking, the Japanese conceptualisation of science and science education. Here I use a similar theme but examine the concept of "nature" from a Chinese perspective and consider how this and other sometimes conflicting Chinese cultural values have affected the Chinese conceptualisation of science and science education.

I have adopted Max van Manenís (1990) *hermeneutic-phenomenological* approach as my epistemological framework for integrating details of my lived experience as a student and teacher in China. My experience is expressed in "impressionistic tales" (John van Maanen, 1988, 1995) interspersed with a more traditional construction of a historical Chinese perspective on science from the literature of the field. This takes on the nature of a *bricolage* (Taylor & Geelan, 1998) as I, a non-Chinese, write about my "understandings, and interpretations" (Denzin and Lincoln, 1994, p3) of the Chinese conceptualisations of nature.

A Chinese Historical Perspective on Nature

The Chinese lived for many centuries in a closed world with their own country at the centre. They developed a culture that had very little foreign influence for many centuries and the Chinese had no contact with other nations at a similar level of development. Pragmatically speaking, China was the Middle Kingdom, the centre of the known world, for her own people, and as such perceptions of nature and science grew independent of any Western influence. Western scientific thinking was largely formed during the Enlightenment when China was largely isolated from the West.

Concepts of philosophy, religion and science are intertwined in Chinese culture. Fung defines philosophy to the Chinese as ësystematic, reflective thinking on life (1948, p.2) and religion as ëa philosophy with a certain amount of superstructure, which consists of superstitions, dogmas, rituals and institutionsí.

Early history describes a civilisation with some rudimentary scientific understanding, controlled by a superstitious belief in the power of nature. At the end of the Shang dynasty (11th ñ 16th century BC), the Doctrine of the Five Elements, an elementary method of categorising nature into components of water, fire, wood, metal and earth was put forward. However at the same time as the development of this primitive science, there was a parallel growth in superstition, especially divination.

Fung explains that China has three philosophies: Taoist, Buddhist and Confucian. Of these, he sees that Taoism and Buddhism are religions as well. Fung (1948, p.3) explains that Taoism as a philosophy ëteaches the doctrine of following

SE013870

natureí while Taoism as a religion has the ëspirit of scienceí and ëteaches the doctrine of working against natureí.

The Chinese word Tao means a way or a path. In Confucian philosophy, which is also called Taoist philosophy by Fung (1948, p3) since it undergirds the Taoist religion, the term Tao was used to speak of the way human beings ought to behave in society. Tao, for them, was an ethical or moral way. Those who had Taoist religious beliefs however, preferred to understand the Tao as the Way of Nature as a whole.

Basic Taoist religious thinking and behaviour involved enabling people to realise that, since human life is really only a small part of a larger process of nature, the only human actions which absolutely make sense are those which are in accord with the flow of Nature. Their sensitivity to the way of Nature inspired them to renounce human thoughts or criteria that might lead to an overly authoritative mode of behaviour or too strong a commitment to the achievement of worldly goals. For these Taoists, such forced assertiveness was the basis and cause of violence and aggression. While Confucian philosophers found virtuous reasons to advise against savagery and to persuade rulers to govern by morality rather than by force, many Taoist believers went even further and denounced violence as reflecting the ultimate ignorance of the Way of Nature.

Ancestor worship served as a stabilising factor in the family and society and the ancestral temple signified political power and authority. Heaven was primarily a place where ancestral spirits lived, but later, during the Han period Taoism defined it:

> Heaven was created by the concentration of Yang, the force of light; Earth was created by the concentration of Yin, the force of darkness. Yang stands for peace and serenity; Yin stands for confusion and turmoil. (Buckley-Ebrey 1981, p.48)

Under Han rule, the Yin-Yang Theory stated above gave rise to the theories of the Four Seasons (Spring, Summer, Autumn, Winter) and Five Elements (metal, wood, water, fire and earth). These Five Elements (Buckley-Ebrey 1981, p.37) were seen as paralleled in the Five Viscera (joy, anger, sympathy, grief and fear) and the Four Seasons represented by cold, heat/dryness, moisture and wind. By balancing Yin and Yang it was believed that sickness and general well being could be controlled.

The Buddhist religion began to develop in China at the same time as Taoism at the end of the Han period. The early development of Buddhism emphasised magic power to ward off demons that caused misery and sickness in a troubled world. Later development of Mahayana Buddhism ëadvocated pity for all creatures and salvation for all humanity as the only possible means of achieving personal salvationí (Yang 1961, p.119). This doctrine of universal salvation endeared Buddhism to large sections of intellectual society and the movement became very powerful by the 6th Century.

The end of Chinese traditional science is recorded by the Chinese (Ronan 1978, p.57) as happening in 1562, with the arrival of Jesuit missionary Matteo Ricci. He gradually introduced Greek and European Renaissance concepts which became integrated with Chinese concepts during the 18th and 19th Centuries.

. At end of the 19th Century and until the First World War, some Chinese intellectuals began to become convinced that science and democracy were important for Chinese development. It must be emphasised here, as an important organising concept, that it was not European science and democracy in their cultural context which were being sought (Fitzgerald 1996, p.40). It was seen that European learning ëwas not valuable in itself, not necessary for a fuller and wider understanding of the whole achievement of the human race, but necessary to give China back the power to compete on equal terms with the Westí

Lin (1979, p.155)) believes that movement described above, the May 4th era, in China portrays a ëtotalistic cultural iconoclasmí with an intellectual revolution, by some, which completely rejected Chinaís past and ëadvocated wholesale Westernisationí. For some this meant a wholesale acceptance of foreign ideology and the need to fight a permanent battle against the superstition and feudalism of the history of China. This battle however was to be fought for the sake of China.

There was a fierce civil war in China, which led to the Communists under Mao Ze Dong seizing power in 1949. Maoís thinking was in some senses culturally very traditional. His attitude to the use of foreign technology and developments was as follows:

> Now, there are two different attitudes towards learning from others. One is the dogmatic attitude of transplanting everything, whether or not it is suited to our conditions. This is no good. The other attitude is to use our heads and learn those things which suit our conditions, that is, to absorb whatever experience is useful to us. That is the attitude we should adopt. (Mao 1957, p.75).

The 20th Century saw a China that was unable to meet the challenge of materialistic rationalism out of its philosophical and religious history (Yang 1961, p378). Many (Tillich 1948, p.98) have identified ëcommunism as a non theistic faith with distinctly religious qualitiesí (Yang 1961, p381). It was this faith which, with its own distinctive Chinese and embedded in a Chinese cultural context, which has shaken the nation during the greater part of the 20th Century.

It has been valuable to me as a teacher of both Chinese and Western students to extract some of the concepts of "nature" which arise from Chinaís history and to determine, through semi-structured interviews (Cobern, 1995) with students about the natural world (not reported here) and my own observations, their relevance to a modern Chinese world view. Major concepts are:

- the Taoist perspective of working with Nature for manís "self-perfection" and the Yin and Yang theory
- Buddhist concepts of magic
- Christian concepts of God and creation
- A "Western" scientific world view adopted in 1912 and entrenched from 1949

Investigating a Modern Chinese world View

I lived and worked in Hong Kong from 1981 until 1991 and gained a basic understanding of the Chinese culture during this time. I have also been learning to speak and read Chinese for sixteen years. I have recently spent two separate periods of six weeks in Mainland China, the first as a student and the second as a tertiary teacher. This enabled me to question high school and tertiary students and their teachers about their understanding of nature and has also given me the opportunity to gain an understanding of their world view as I have lived and worked with them.

A COUNTRY STUDENTíS VIEWS ON NATURE

My favourite student was Yan, a seventeen-year old country girl. There was really no reason why Yan had such fluent English; she had come from the country and had no special lessons or advantage but her English was far more fluent than many of her professors. She told me a lot about country people and gave some insights into student life.

She talked about Chinaís one child policy. Yan is passionate about children and their care, and feels the one child policy is absolutely correct. She is a little disappointed with her sisters and neighbours who, being country people, have been allowed to produce more than one child. (*If the first is a girl you can have a second chance , but I am sure I saw families with two boys as well).*

Yan, like most of her classmates, is very worried about the West. In particular our high divorce rate bothers her and the way the newspapers have told her we ill-treat our children. She had no idea of Western cultural values (either Christian or humanist) or the way we live our lives.

Yan would love to travel to the West but wants to end up in her own village. Her village is the best place in the world and is the only place for miles around (*in the whole of China?)* which is not polluted. She described her village as a clean place where the sun always shines. She hates the pace of student life although she is very hard working. She envies her brother, who only has to go out to the fields if he feels like it, except at the busiest time of year. She is studying to be an engineer but, like the majority of her classmates, she did not pick this discipline, the Government allocated her to

engineering in this particular college based on her high school graduation marks. She would have preferred to study English but now thinks she will study computers and set up her own computer college in her village when she graduates *(this is possible in New China!)*

Yan likes fashionable clothes and would like to learn to drive like Western women. Her elder brother started to teach her secretly when their parents were not home, but a neighbour spotted her and now her parents have forbidden her from driving the truck again. Each time her mother goes out leaving her in the house with her brother, she reminds Yan not to try to learn to try again and Yan feels obliged to obey her.

Yan feels that life in China is improving for people, especially country people. She is proud of the countryís economic development. She remembers the time when people did not have enough to eat and had to survive on vegetables and rice. ëNowí, she proudly told me, ëthey have eggs and meat most daysí.

When we talked about nature, Yanís perspective was very clear. Her view of nature was definitely that of her science teacher, a "typical" Western scientific world view. Nature is material. It is powerful, real and concrete. It could not possibly be considered sacred, spiritual or holy. Yan says that the modern Chinese world does not really hold to concepts of the spiritual or the sacred as in the West. Yan did think that nature was mysterious but I think this was with a view to saying it was puzzling and not completely defined. Yanís concept of nature was one that did not really seem explicitly to include man. She included a concept in talking about man that was repeated by other students in my conversations with them, though. This was the one of mankindís need to perfect himself. This seemed to be an important role which man is meant to play in the world and in nature. (*I am sure this concept comes from Confucius).* How he was meant to do this was not made clear. I did feel that it was, however, deeply embedded in the Chinese mind along with the concept of service. The paramount role of man (and woman) is to serve the country. All the students I spoke to expressed this with passion and without embarrassment.

A VISIT TO THE DOCTORíS CLINIC

This is what I experienced when I got bronchitis for the second time in a month in China. I had finished a complete course of antibiotics and so was forced to go and see a doctor. I had dreaded this because I imagined the medicine. *[Recollections of Chinese medicine shops in Hong Kong, so many antlers and bear paws]*

Professor Sun, my tutor, came with me, on a day when the outside temperature was about -10*f*, and the surgery was similar to that in my textbook, item for item. The surgery was stuffy and hot. The nurse was sitting in the corner next to a coal fire, clothed in many layers, wearing a woolly hat. She did not stop knitting all the time or do anything very medical. Her presence was obviously very important though. The doctor came in. He was wearing his outdoor clothing with a white lab coat over the top and a white surgeonís hat on his head. He talked to me slowly and I found him easy to understand. I used the vocabulary of *Chinese Practical Reader, Volume 2, Chapter 3,* which I had studied two years previously.

[This vocabulary was totally sufficient but I had always wondered why, Palanka, the English heroine of the story, studying Chinese in Beijing, had need to be admitted to hospital just because she had flu. And what were the injections for? I asked myself as I gazed at the doctor.]

ëI have the flu and I have a temperature. I have a bad coughí. He asked me to cough so I did. This was the end of the examination. He began to write a prescription. He stopped and looked at me: ëWhy have you got bronchitis?í. I thought this was an odd question, but putting on my Chinese thinking hat, I answered, ëAt Spring Festival, I went to Beijing. The temperature outside was very cold; the temperature inside was very hot. This was not good for my body so I am sickí.

This was obviously the right answer and he told Professor Sun, an old friend, that I must be a good student because my Chinese was good. I knew that it was my culturally correct answer he approved of not my tones. The correct answer, left unsaid, was obvious to me.

[ëThis is a highly polluted city with continuous smog [they even taught us the word for ëair pollutioní so they must know] because you burn so much coal to purify your water. The water is polluted because of

all the effluent you pump into the Yangse River. Your people sometimes border on malnourishment and there is still a lot of tuberculosis around. They spit on the ground all the time and so infection spreads quicklyí]

After some thought from the doctor, I received both Chinese and Western medicine, because I was a Westerner in China. I could tell the Chinese cure was laced with codeine though from the way I walked around in a daze when I took it.

TEACHING COMPUTER SCIENCE

I managed to pay a visit to the University Computer department (I was a Computer lecturer myself at the time in Australia). This was a definite culture shock too. The computers, 386s and old at the time, were kept in a special air-conditioned and carpeted room. People wore white coats and slippers if they wanted to use them. Most students (and only the best study computers) were doing basic Basic programming and learning the details by rote. I tried to investigate whether they used Windows, or anything modern, but the lecturer was only interested in the length of computer courses in Australia. There seemed to me to be no parallels in our courses at all. The students seemed only to learn Basic programming *[I wondered what job this would qualify them for!]* . It seemed too that things like word processing *[the Chinese have a special keyboard and it takes 5 keys together to create one character]* were a matter for female secretaries and did not enter the arena of the university. I tried to explain the issue of the ëcomputer as a toolí but I could see that the body language was saying ëCrazy Westerner!í when I tried to put across the concept of teaching the long-term unemployed to use computers. Computers are for the young and highly intelligent in China.

THE PHILOSOPHER

I spent a lot of evenings talking to Qin. I think it started when I finally began to understand his accent, and discovered he had a Masters degree in Western philosophy, and he had a well-developed philosophy of science and education. He was surprised that I had an interest in philosophy and was trying to read Confucius in Chinese. He had an amazing theoretical knowledge of the West, and had read widely in English literature (in translation into Chinese), and even as far back as the early Catholic writers such as Thomas Aquinas. We had very strained conversations because he would not use any English and I bought a dictionary of philosophy to help us. Memorable evenings include going with him and others to the Confucius temple, eating very strange food in the market and then coming back and trying to compare the moral values of Confucius with those of Jesus. He read Confucius slowly to me in Chinese and tried to explain the 12 Virtues. I read the Bible to myself and tried to translate what was there into simple Chinese for him.

Our conversation continually drifted back to our relative cultures; he really wanted to know why Australians behave as they do *[naive, loud and drunk was the inference*], why did they not keep rules, why did the non-Chinese Australians not study hard? I had to keep reminding him that, really, I am not an Australian, and talked to him about the values I had gained from my parents, what I had taught my children, how I related to my husband. We conjectured together about the ëbig, lucky countryí.

We talked about stereotypes and his images of the West were those of not-so-modern Hollywood. The image of the heavily made-up, smoking, drinking Western woman *[she must be a prostitute!]* was firmly in his mind. I gained approval for my lack of make-up. I donít smoke or drink but my appearance, which I saw as a scruffy attempt to simultaneously maintain dignity and blend in, gained me some kudos.

We talked about education and he thoroughly approved of the rigid conservativeness of his own system. He continuously recited lists of facts and dates, Chinese dynasties and other notable memorabilia. I vainly tried to remember the facts of high school *[hydrogen, helium, lithium, carbon.. , 1066 William the Conqueror]* but did not even try to display what I knew.

We discussed the theme of my research. He got very passionate about something I could not totally understand. He kept telling me that something important happened in 1912, something to do with what I was studying and this, he considered, had a very bad effect on Chinese society. *[I ran my mind through events of the time, sinking of the Titanic, Russian revolution, World War I but it was none of these.]* Eventually, with the help of a third

party, I was able to understand that in 1912 China sent its first scholars overseas to study Western science. In Qinís opinion, this led to the undermining of cultural values, the development of a social and political agenda which mimicked that of the West and a loss of all that had been good in Chinese society. His perspective was that the values of Confucius (12 virtues) with an emphasis on honour and filial piety, were lost in this experiment and talked about the ëspiritual pollutioní which had taken place in traditional Chinese life. We started talking about Chinese traditional religion, Buddhism and Taoism, and something of the nature of worship which I had seen in Hong Kong. This included family altars, gods and goddesses of the hearth and home, giving food for spirits and demons to eat in order to protect the family life, grave cleaning and the ritual offering of pigs. At first Qin found this a difficult subject to discuss so I told him that I believed in the existence of spirits. He said,

ëMy mother believes in demons ÖÖ She gets very frightened and she has to do many things to keep them awayí. He looked at my face and did not see disapproval or ridicule. So he continued:

ëMy wife believes in demons and she has to be very careful of our son. I donít believe in demons but.. I did have a very bad illness once.í

[I had to really encourage him to continue. It was really important to me to find out if Maoís communism had really removed all forms of superstition and worship as claimed. Had he become an idol himself? The almost-demised Deng Xiao Pingís regime had allowed an openness in the area of faith, and I had seen newly opened Buddhist temples, Catholic churches (no affiliation with Rome) and practising Moslems]

He told me that when he was sick, he had nearly died and then a spirit of death had come from heli to get him *[ëYou call him Satan,í he said].* It seemed obvious that this had been a terrible experience and it seemed that his mother was doing something to make it go away. It seemed obvious too that Western medicine could not supply the whole answer to a Chinese health problem either. I learned that he and other Chinese people believed that there were two totally different sorts of medicine. One was the Western kind that worked quickly on Western people and the other kind was the Chinese herbal and traditional kind that needed to work slowly.

[The explanation given is that Westerners lead a fast life and need fast medicine. Chinese lead a slow life and need slower medicine. It would not be good for them to be cured as quickly as Westerners. It makes a lot of sense to me in China!]

I felt he was displaying what I had imagined would be a typical Chinese world view. I could see responses to nature that he would have been taught in his science lessons at school. I could also identify a perspective that allowed for the views on the mysterious and spiritual nature of the world to be held in tension with the scientific views of the concrete and the material. I was surprised too in his description of the world as frightening and with concepts of chaos. As I reflected on his stories of his life, the turmoil of childhood in the Cultural Revolution, and now separated by legal bureaucracy from his wife and child for more than two years, I wondered quite how he defined nature and how it was separate from life itself to him. I felt like he had given me something of his perspective on life, in the guise of his concepts of the natural world.

CONCLUSIONS

The results of my conversations with Yan and her classmates convinced me that China has succeeded in removing traditional explanations about nature from their everyday thinking. Glimpses of Confucian teaching in their obedience and " self-perfection" peep through a very natural description of nature without resource to the vocabulary of religion and with no apparent difference in vocabulary between the genders.

My experience with the Doctor and the Philosopher convinced me too that there is still an older generation which is and was influenced by traditional explanations gained from religion and history. These older people keep the two sets of beliefs held in tension ñ they offer Western and Chinese medicine for a disease (it should be noted here that the Chinese medicine very definitely deals with maintaining the balance between Yin and Yang) and Western and Chinese explanations to a problem.

Current Chinese science curriculum is largely based on that of the West in a desire to import Western knowledge to maintain Chinaís internal and external balance of power. Its school science curriculum is largely devoid of any traditional concept of nature as expressed in the Taoist and Confucian philosophy which still shapes much of Chinaís cultural and moral values. This compares radically with the situation described by Ogawa (1998, p.158) which describes the way that school science is taught in Japan with a traditional Japanese world view (Shizen) which compares with the Taoist view of the holistic nature of nature.

Ogawa (1998, p.159) concludes by suggesting that each group of people should capitalise on their culture as they ask the question ë*What should science education be like for us?"* My research suggests that, for Mainland China, this question began to be answered in 1912 when, in a response to feudalism and poverty, Chinese science and science education became "westernised" for essentially patriotic and economic reasons.

From 1976 until the present, the education system has been modernised to resemble that of the West. In 1995, the Chinese National Conference on Education agreed on a strategy of ëinvigorating the nation through science and educationí. In 1996, the Ninth Five-Year Plan of National Economic and Social Development and Long-Term Goals Through the Year 2010 included:

- Nine years of compulsory education
- Elimination of illiteracy
- Development of scientific research
- Reform in admission systems, funding models and a delegation of authority to local governments. (China Org, 1998).

Reading previous Five-Year Plans, the development of the Chinese education system can be seen to mirror the development of that of many Western countries including America and Australia. Recent English language articles in the Chinese press (China Daily, April 24 th 1998) use the jargon of globalisation, flexible delivery, student centred-learning and display an emphasis on information technology which is familiar to those involved in Higher Education, indicating, at least publicly, a commitment to all that is valued overseas.

References

Buckley-Ebrey, P. (1981). *Chinese Civilisation and Society: A source book* , The Free Press, New York.

Cobern, W.W. (1995). ëEveryday thoughts about nature: An interpretive study of 16 ninth graders' conceptualizations of natureí, *paper presented at annual meeting of the National Association for Research in Science Teaching,* San Francisco.

Cobern, W.W. (Ed.). (1998). Socio-Cultural Perspectives on Science Education. Dordrecht, The Netherlands: Kluwer.

Denzin, N. & Lincoln, Y. (1994). *The handbook of qualitative research in education.* Newbury Park, CA: Sage.

Fitzgerald, C.P. (1966). *The Chinese View of their Place in the World,* Oxford University Press, London.

Fitzgerald, S. (1977). *China and the World* , Australian National University Press, Canberra.

Fung, Y.L. (1966). *A Short History of Chinese Philosophy,* trans. D.Bodde, Free Press, NY, USA.

Lin Y.S. (1979). *The Crisis of Chinese Consciousness: Radical Antitraditionalism in the May Fourth Era,* The University of Wisconsin Press, Madison, Wisconsin.

Mao, T.T. (1957). *Selected Works of Mao* , Foreign Languages Press, Beijing.

Ogawa, M. (1998). A Cultural History of Science Education in Japan: an Epic Description. In W.W. Cobern (Ed.). *Socio-Cultural Perspectives on Science Education* (pp139- 161). Dordrecht, The Netherlands: Kluwer.

Ronan, C.A. (1978) *The Shorter Science and Civilisation in China, vol. 1* . Cambridge University Press, Cambridge, UK.

Taylor, P.C & Geelan, D.R. (1998). *Writing One's Lived Experience: Beyond the (Pale) Hermeneutic?* Paper presented at the annual meeting of the National Association for Research in Science Teaching, San Diego, 19-22 April 1998.

Tillich, P. (1948). The Shaking Of The Foundations, Unknown, NY.

Van Maanen, J. (1988). *Tales of the field: On writing ethnography.* Chicago: The University of Chicago Press.

Van Maanen, J. (1995). An end to innocence: The ethnography of ethnography. In J. van Maanen (Ed.), *Representation in ethnography* (pp. 1-35). Thousand Oaks, CA: Sage.

Van Manen, M. (1990). *Researching lived experience: Human science for an action sensitive pedagogy.* London, Ontario: SUNY Press.

Yang, C.Y. (1961). Religion in Chinese Society, University of California, Los Angeles.